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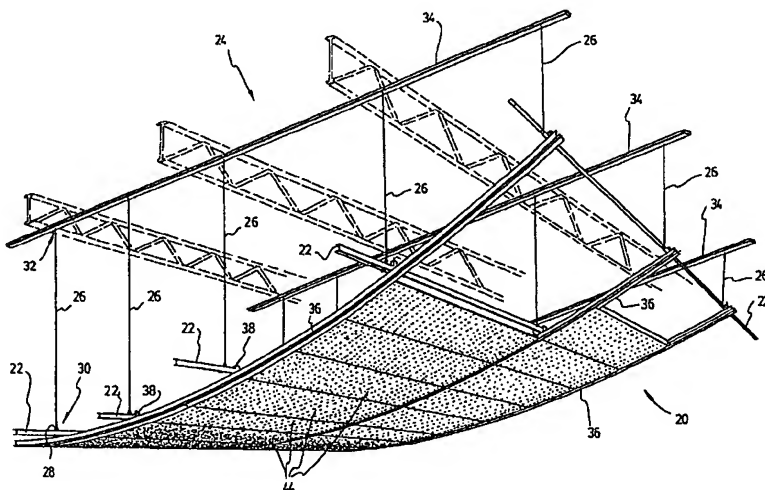
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(54) Title: SUSPENDED CEILING ASSEMBLY



(57) Abrégé/Abstract:

A suspended ceiling assembly and method for mounting such an assembly to provide an inner ceiling suspended under the framework of a roof. The assembly includes a plurality of suspension beams suspended in parallel to each other under the framework by cables. A plurality of mounting rails are mounted transversally underneath the suspension beams with the help of connecting members. The connecting members each have a sleeve-shaped body for enclosing a cross-section of a corresponding suspension beam therein, fasteners for fastening the sleeve-shaped body to this corresponding suspension beam, and a hook-shaped bottom portion engageable with the top flange of a corresponding mounting rail for supporting this mounting rail. The ceiling tiles are mounted between the bottom mounting portions of adjacent mounting rails. Advantageously, the assembly according to this invention is versatile and allows to easily mount an inner ceiling of a desired shape to any framework.



ABSTRACT

A suspended ceiling assembly and method for mounting such an assembly to provide an inner ceiling suspended under the framework of a roof. The assembly includes a plurality of suspension beams suspended in parallel to each other under the framework by cables. A plurality of mounting rails are mounted transversally underneath the suspension beams with the help of connecting members. The connecting members each have a sleeve-shaped body for enclosing a cross-section of a corresponding suspension beam therein, fasteners for fastening the sleeve-shaped body to this corresponding suspension beam, and a hook-shaped bottom portion engageable with the top flange of a corresponding mounting rail for supporting this mounting rail. The ceiling tiles are mounted between the bottom mounting portions of adjacent mounting rails. Advantageously, the assembly according to this invention is versatile and allows to easily mount an inner ceiling of a desired shape to any framework.

SUSPENDED CEILING ASSEMBLY

FIELD OF THE INVENTION

The present invention belongs to the field of suspended ceilings and more particularly relates to a versatile assembly and a method for mounting a suspended inner ceiling under the framework of a roof.

BACKGROUND OF THE INVENTION

Suspended ceilings are well known in the art. They usually consist of a flat grid suspended horizontally under the framework of a roof having square or rectangular shaped holes for receiving tiles of the same shape. The tiles are supported from every side by the grid posts, and may usually be removed or displaced by simply pushing on tiles from underneath.

Traditional suspended ceilings lack versatility in that they cannot easily be adapted to define a profile of a different shape than the flat surface described above. In addition, since the tiles are supported from underneath, the grid is visible and breaks the continuity of the design. Also, no means is provided to prevent access to the space above the suspended ceiling to unauthorized individuals.

Improvements in this field are disclosed for example U.S. patents nos. 4.428.454; 4.566.233; 4.586.841; 4.663.911; 4.833.854; 5.564.250; and 6.029.413. However, none of the devices disclosed in those patents provide solutions to the above mentioned drawbacks.

OBJECTS AND SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a suspended ceiling assembly that allows an inner ceiling of various profiles to be mounted underneath the framework of a roof.

Another object of the invention is to provide a suspended ceiling assembly for which the beams supporting the ceiling tiles may be partially or totally hidden.

Yet another object of the invention is to provide a method of mounting such a ceiling to the framework of a roof.

More particularly, the present invention provides a suspended ceiling assembly for mounting an inner ceiling under a framework of a roof. The assembly includes a plurality of suspension beams, which are suspendable underneath the framework in a parallel relationship to each other. A plurality of cables are also
5 provided for connecting the suspension beams to the framework. Each cable has a length adapted to suspend a corresponding suspension beam at a predetermined distance from the framework. A plurality of mounting rails are also provided. Each mounting rail is transversally mountable underneath at least two of the suspension beams, and has a top flange and a bottom mounting portion. The assembly
10 includes a plurality of connecting members each devised for connecting the top flange of one of the mounting rails to one of the suspension beams. Each connecting member has a sleeve-shaped body for enclosing a cross-section of a corresponding suspension beam therein, fasteners for fastening the sleeve-shaped body to this corresponding suspension beam, and a hook-shaped bottom
15 portion engageable with the top flange of a corresponding mounting rail for supporting this mounting rail.

The assembly finally includes a plurality of ceiling tiles each mountable between the mounting portions of adjacent mounting rails, for forming the inner ceiling.

20 The invention also provides a method for mounting an inner ceiling under a framework of a roof. The method includes the steps of:

a) suspending a plurality of suspension beams underneath the framework in a parallel relationship to each other. A plurality of cables are provided for connecting the suspension beams to the framework, and each of the cables has a
25 length adapted to suspend a corresponding suspension beam at a predetermined distance from the framework;

b) mounting a plurality of mounting rails transversally underneath at least two of the suspension beams, each of said mounting rails having a top flange and a bottom mounting portion. A plurality of connecting members are provided for
30 connecting the top flange of each one of the mounting rails to a corresponding suspension beams. Each connecting member has a sleeve-shaped body for

enclosing a cross-section of a corresponding suspension beam therein, fasteners for fastening the sleeve-shaped body to this corresponding suspension beam, and a hook-shaped bottom portion engageable with the top flange of a corresponding mounting rail for supporting this mounting rail; and

- 5 c) mounting a plurality of ceiling tiles between the mounting portions of adjacent mounting rails, thereby forming the inner ceiling.

Other features and advantages of the present invention will be better understood upon reading the following description of preferred embodiments thereof, with reference to the accompanying drawings.

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BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a suspended ceiling assembly mounted underneath the frame work of a roof according to a preferred embodiment of the invention.

- 15 FIG. 2 is a side elevational view of the assembly of FIG. 1.

FIG. 3 is a side elevational view of a portion of an inner ceiling made from an assembly according to another preferred embodiment of the invention.

FIG. 4 is a perspective view showing the mounting of two adjacent ceiling tiles on a mounting rail in accordance with the embodiment of FIG. 3.

- 20 FIG. 5 is an exploded perspective view of a suspended ceiling assembly according to the embodiment of FIG. 1.

FIG. 6 is a side elevation of a portion of an inner ceiling made from the assembly of FIG. 5.

- 25 FIG. 7A is a side elevation showing the adjacent extremities of two tiles when one of said tiles is being mounted next to the other; FIG. 7B is a side elevation showing the tile of FIG. 7B when mounted; and FIG. 7C is a side elevation showing how to remove the tiles of the preceding figures.

- FIG. 8A is a bottom view of an inner ceiling mounted in accordance with the embodiment of FIG. 3; and FIG. 8B is a bottom view of an inner ceiling mounted in accordance with the embodiment of FIG. 1.
- 30

DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

Referring to FIGs. 1 and 2, there is generally shown an inner ceiling 20 made from a suspended ceiling assembly according to the present invention. The features of the invention explained hereinbelow are common to both the first and the second preferred embodiments of the invention.

The ceiling 20 includes a plurality of suspension beams 22 suspended underneath the framework 24 of a roof. The suspension beams 22 all extend in a parallel relationship to each other, but, as is exemplified in the illustrated embodiment, may be disposed at different distances from the framework 24. The advantages of such a set-up will be explained hereinafter. The suspension beams preferably each have squared C-shaped cross-sections. A plurality of cables 26 are provided for connecting the suspension beams 22 to the framework 24. Preferably, the suspension beams 22 each have a number of hooks 28 projecting therefrom, which may of course be replaced by any other appropriate fastening means. In the illustrated embodiments (see for example FIG. 5), the hooks are embodied by a C-shaped clamp 27 fastened to the suspension beam 22 at any appropriate location and a loop 29 projecting integrally from the top, and a lower end 30 of each cable 26 is attached to one of the hooks 28. The upper end 32 of the cables 26 is attached to wooden beams 34, or any other structural element of the framework solid enough to support the weight of the inner ceiling 20. The length of each cable 26 between the lower and the upper ends 30 and 32 is chosen so that the corresponding suspension beam 22 extends at the desired distance from the framework 24. Advantageously, the use of cables of a given length can also easily allow to adapt a given assembly to a framework of uneven height, as best seen in FIG. 2.

The inner ceiling 20 further includes a plurality of mounting rails 36. Each mounting rail 36 has a top flange 40 and a bottom mounting portion 42, and is mounted transversally under two or more suspension beams 22. A plurality of connecting members 38 are also provided, to connect the mounting rails 36 from its top flange 40 to the corresponding suspension beams 22. At least one connecting member 38 is preferably provided at each crossing point between the

mounting rails 36 and suspension beams 22. Advantageously, the mounting rails 36 may be given a variety of profiles other than a straight one, as was previously known in the art. For example, in the illustrated embodiment of FIGs. 1 and 2, the mounting rails 36 each define an arch section, and the height of each suspension beam 22 is adjusted accordingly. The inner ceiling finally includes a plurality of ceiling tiles 44, each mountable between the mounting portions 42 of adjacent mounting rails 36.

Referring to FIG. 5, the connecting members 38 are shown as preferably having a sleeve-shaped body 46 which completely encloses a cross-section of a suspension beam 22. The sleeve-shaped body 46 is preferably fitted over the desired section of a suspension beam 22 and fastened thereto with nut 48 and bolt 49 affixed on top of the connecting member 38, which is provided with an opening therein for that purpose. Of course, any other appropriate type of fasteners may be used. The sleeve-shaped body 46 has a hook-shaped bottom portion 50 which is engageable with the top flange 40 of the mounting rails 36. Advantageously, the connecting members may be affixed at any point of the suspension rails 22, making the assembly of the mounting rails very adaptable to the dimensions and physical properties of a particular ceiling.

20 Description of the first preferred embodiment of the invention

With reference to FIGs. 3, 4 and 8A, there is shown a first preferred embodiment of a suspended ceiling assembly according to the present invention.

In this embodiment, each mounting rail 36 has an S-shaped cross-section forming a top and a bottom hook. The top hook defines the top flange 40 of the mounting rail, and is therefore engageable with the hook-shaped bottom portion 50 of the connecting members 38 as best seen in FIG. 3. The bottom hook defines the bottom mounting portion 42 of the mounting rail 36, and serves to support the ceiling tiles 44 as explained below.

In this embodiment, the ceiling tile 44 includes a panel 52 having a back surface 54 and a first 56 and second 58 set of two opposed parallel edges. In the illustrated embodiment, the panel 52 is rectangular shaped, but tiles having other

shapes such as squares or trapezoids may conceivably be used. A hooking member 60 preferably projects from the back surface 54 of the panel 52, along one of the edges of the first set 56. The hooking member 60 opens towards the panel 52 as is better seen in FIG. 4. The hooking member 60 is engageable with the bottom hook defining the mounting portion 42 of an adjacent mounting rail 36. On the other side of the panel 52, along the other edge of the first set 56, a first L-shaped member 62 projects from the back surface 54 of the panel 52. Contrary to the hooking member 60, the first L-shaped member 62 is oriented away from the panel 52. The side of the panel 52 provided with the first L-shaped member 62 is mounted on the mounting portion 42 of the mounting rail 36 by engaging the first L-shaped member 62 with the hooking member 60 of an adjacent ceiling tile 44 when it is itself engaged with the bottom mounting portion 42 of one of the mounting rails 36. For this purpose, each hooking member 60 is provided with at least one pin 64 rigidly projecting from its top surface, and each first L-shaped member 62 is provided with at least one opening 66 therein engageable with the pin 64 of the hooking member 60 of an adjacent ceiling tile 44. An advantage of this pin and opening engagement is that it provides a means for aligning the ceiling tiles together along their length (positive alignment).

Advantageously, as may be seen in FIG. 8A, the inner ceiling mounted according to the first embodiment, has a continuous appearance from underneath, since all of the suspension beams or mounting beams are hidden under the ceiling tiles.

Description of the second preferred embodiment of the invention

With reference to FIGs. 5, 6 and 8B, there is shown a second preferred embodiment of the present invention.

In accordance with this new embodiment, a number of the mounting rails 36 each have an I-shaped cross-section, including a middle, a top and a base portion 68, 70 and 72. The top portion 70 defines the top flange 40 of the mounting rail 36, and forms two top hooks 74 extending on either side of the middle portion 68. Each of the top hooks 74 is engageable with one of the connecting members 38,

as best seen in FIG. 6. With this type of mounting rail, two connecting members 38 are preferably provided at each crossing point between the mounting rails 36 and the suspension beams 22, one engaged with each top hook 74. Similarly, the base portion 72 defines the bottom mounting portion 42 and forms two bottom hooks 76 extending on either side of the middle portion 68.

The I-shaped mounting rails are well adapted for supporting the ceiling tiles across most of a given ceiling, but may be unsightly and interfere with proper placement of the rails at the edges of the ceiling. There are therefore provided within the present embodiment a number of mounting rails having a C-shaped cross-section, adapted to support the ceiling tiles along the edges of the ceiling. Similarly, the C-shaped rails each have a middle portion 78, a top portion 80 and a base portion 82. The top portion defines the top flange 40 and forms a top hook 84 extending on one side of the middle portion 78, the top hook 84 being engageable with one of the connecting members 38, and the base portion 82 defines the bottom mounting portion 42 and forms a bottom hook 86 extending on said one side of the middle portion for mounting one of the ceiling tiles thereto.

As with the ceiling tile described before, the tiles 44 appropriate for this embodiment also have a panel 52 with a back surface 54 and a first and a second set of two opposed parallel edges 56 and 58. In this case two hooking members 88 and 90 are provided along each of the edges of the first set 56. Each hooking member projects from the back surface 54 away from the panel 52, and is engageable with one of the hooks formed by the mounting portion 36 of an adjacent mounting rail 36.

In this embodiment, as may be seen in FIGs. 1 and 8B, the ceiling tiles 44 are mounted in rows and the underside of the mounting rails is visible from the room provided with such a ceiling.

With reference to FIG. 5, there are shown a few additional features that although applied here to the second embodiment of the invention, could equally be included in the first or any further embodiments of the present invention.

Preferably, rubber pieces 102 are installed at various positions over the hooks of the bottom mounting portion 42. The rubber pieces 102 advantageously

damper the engagement of the ceiling tiles with the suspension rails 36 and provide the inner ceiling with more stability since they prevent the tiles from rocking.

5 Additionally, C-shaped end beams 104 may be transversally installed at the extremities of the mounting rails 36 to give a finished look to the transversal edges of the ceiling.

For manufacturing and transport convenience, each suspension beam 36 may be made of sections assembled on site, end to end. Connecting pieces 106 of an appropriate shape are then provided with nuts and bolts 108 to attach them to
10 the mounting rail sections.

Referring to FIGs. 4 and 7A to 7C, there is shown an additional feature of the invention which may be included in either one of the embodiments described above. Each ceiling tile 44 preferably includes a first and a second side member 92 and 94, each being L-shaped and projecting from the back surface 54 of the panel 52 along one of the edges of the second set 58. Both the first and second side members 92 and 94 are oriented towards the panel 52, similarly to the hooking member 60. The first side member 92 has a tab 96 resiliently projecting therefrom, outwardly from the ceiling tile 44 (FIG. 7A). The second side member 94 is provided with a slit 98 adapted to receive the tab 96 of an adjacent ceiling tile
15 therein (FIG. 7B). This feature has several advantages. It allows the ceiling tiles to be aligned with each other and to be suspended all at the same height. In addition, once two tiles are locked together in this manner, it is impossible to remove one of them without using a proper tool 100 to push the tab 96 out of the slit 98 as shown in FIG. 7C.
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Description of a method according to the invention

In accordance with a preferred embodiment of the invention, there is also provided a method for mounting an inner ceiling under a framework of a roof as shown in FIG. 1. This method includes the following steps of:

30 a) suspending a plurality of suspension beams 22 underneath the framework 24 in a parallel relationship to each other. A plurality of cables 26 are

provided for connecting the suspension beams 22 to the framework 24. Each of the cables 26 has a length adapted to suspend a corresponding suspension beam 22 at a predetermined distance from the framework 24;

- 5 b) mounting a plurality of mounting rails 36 transversally underneath at least two of the suspension beams 22. Each mounting rail 36 has a top flange and a bottom mounting portion and may have an S-shaped, I-shaped or C-shaped cross-section as described above. A plurality of connecting members 38 are provided for connecting the top flange of each one of the mounting rails 36 to a corresponding suspension beam 22. Preferably, each connecting member 38 includes a sleeve-shaped body for enclosing a cross-section of a corresponding suspension beam 10 22 therein, fasteners for fastening them together and a hook-shaped bottom portion engageable with the top flange of a corresponding mounting rail 36; and

 c) mounting a plurality of ceiling tiles 44 between the mounting portions of adjacent mounting rails 36, thereby forming the inner ceiling 20.

- 15 Of course, numerous modifications could be made to the embodiments described above without departing from the scope of the invention as defined in the appended claims.

WHAT IS CLAIMED IS:

1. A suspended ceiling assembly for mounting an inner ceiling under a framework of a roof, the assembly comprising:
 - 5 a plurality of suspension beams suspendable underneath the framework in a parallel relationship to each other;
a plurality of cables for connecting the suspension beams to the framework, each of said cable having a length adapted to suspend a corresponding suspension beam at a predetermined distance from said framework;
 - 10 a plurality of mounting rails each transversally mountable underneath at least two of the suspension beams, each of said mounting rails having a top flange and a bottom mounting portion;
a plurality of connecting members, each of said connecting members being devised for connecting the top flange of one of the mounting rails to one of the suspension beams, each of said connecting member comprising a sleeve-shaped
15 body for enclosing a cross-section of a corresponding suspension beam therein, fasteners for fastening said sleeve-shaped body to said corresponding suspension beam, and a hook-shaped bottom portion engageable with the top flange of a corresponding mounting rail for supporting said mounting rail; and
 - 20 a plurality of ceiling tiles each mountable between the mounting portions of adjacent mounting rails, for forming said inner ceiling.
2. A suspended ceiling assembly according to claim 1, wherein the fasteners
25 comprise nuts and bolts.
3. A suspended ceiling assembly according to claim 2, wherein each suspension beam has a C-shaped cross-section.
4. A suspended ceiling assembly according the claim 1; wherein the ceiling tiles
30 are made of metal.

5. A suspended ceiling assembly according to claim 1, wherein each of said mounting rails has an S-shaped cross-section forming a top hook defining the top flange and a bottom hook defining the mounting portion.

- 5 6. A suspended ceiling assembly according to claim 5, wherein each ceiling tile comprises:

a panel having a back surface and a first and a second set of two opposed parallel edges;

10 a hooking member projecting from the back surface of the panel along one of said parallel edges of the first set and towards said panel, said hooking member being engageable with the bottom hook of an adjacent mounting rail; and

15 a first L-shaped member projecting from the back surface of the panel along another one of said parallel edges of the first set and away from said panel, said first L-shaped member being engageable with the hooking member of an adjacent ceiling tile when said hooking member of an adjacent ceiling tile is engaged with the bottom hook of one of the mounting rails.

7. A suspended ceiling assembly according to claim 6, wherein:

20 said hooking member is provided with at least one pin rigidly projecting therefrom; and

said first L-shaped member is provided with at least one opening therein engageable with the at least one pin of said hooking member of an adjacent ceiling tile.

- 25 8. A suspended ceiling assembly according to claim 6, wherein each ceiling tile further comprises a first and a second L-shaped side member each projecting from the back surface of the panel along one of said parallel edges of the second set and towards said panel, the first side member being provided with a tab resiliently projecting therefrom outwardly from the ceiling tile, and the second side member
30 being provided with a slit adapted to receive the tab of an adjacent ceiling tile

therein when said ceiling tile and adjacent ceiling tile are mounted between the mounting portions of adjacent mounting rails.

9. A suspended ceiling assembly according to claim 1, wherein a number of the plurality of mounting rails each have an I-shaped cross-section having:

a middle portion;

a top portion defining said top flange and forming two top hooks extending on either sides of the middle portion, each of said top hooks being engageable with one of the connecting members; and

10 a base portion defining said bottom mounting portion and forming two bottom hooks for mounting one of the ceiling tiles thereto, said bottoms hooks extending on either side of the middle portion.

10. A suspended ceiling assembly according to claim 9, wherein each ceiling tile comprises:

a panel having a back surface and a first and a second set of two opposed parallel edges;

20 a first and a second hooking members each projecting from the back surface of the panel along one of said parallel edges of the first set and away from said panel, each of the first and second hooking member being engageable with one of the bottom hooks of an adjacent mounting rail.

11. A suspended ceiling assembly according to claim 10, wherein each ceiling tile further comprises a first and a second L-shaped side member each projecting from
25 the back surface of the panel along one of said parallel edges of the second set and towards said panel, the first side member being provided with a tab resiliently projecting therefrom outwardly from the ceiling tile, and the second side member being provided with a slit adapted to receive the tab of an adjacent ceiling tile therein when said ceiling tile and adjacent ceiling tile are mounted between the
30 mounting portions of adjacent mounting rails.

12. A suspended ceiling assembly according to claim 1, wherein at least one of the mounting rails has a C-shaped cross-section having:

a middle portion;

5 a top portion defining said top flange and forming a top hook extending on one side of the middle portion, said top hook being engageable with one of the connecting members; and

a base portion defining said bottom mounting portion and forming a bottom hook for mounting one of the ceiling tiles thereto, the bottom hook extending on said one side of the middle portion.

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13. A suspended ceiling assembly according to claim 12, wherein each ceiling tile comprises:

a panel having a back surface and a first and a second set of two opposed parallel edges;

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a first and a second hooking members, each projecting from the back surface of the panel along one of said parallel edges of the first set and away from said panel, either of the first and second hooking member being engageable with the bottom hook of an adjacent mounting rail.

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14. A suspended ceiling assembly according to claim 13, wherein each ceiling tile further comprises a first and a second L-shaped side member each projecting from the back surface of the panel along one of said parallel edges of the second set and towards said panel, the first side member being provided with a tab resiliently projecting therefrom outwardly from the ceiling tile, and the second side member
25 being provided with a slit adapted to receive the tab of an adjacent ceiling tile therein when said ceiling tile and adjacent ceiling tile are mounted between the mounting portions of adjacent mounting rails.

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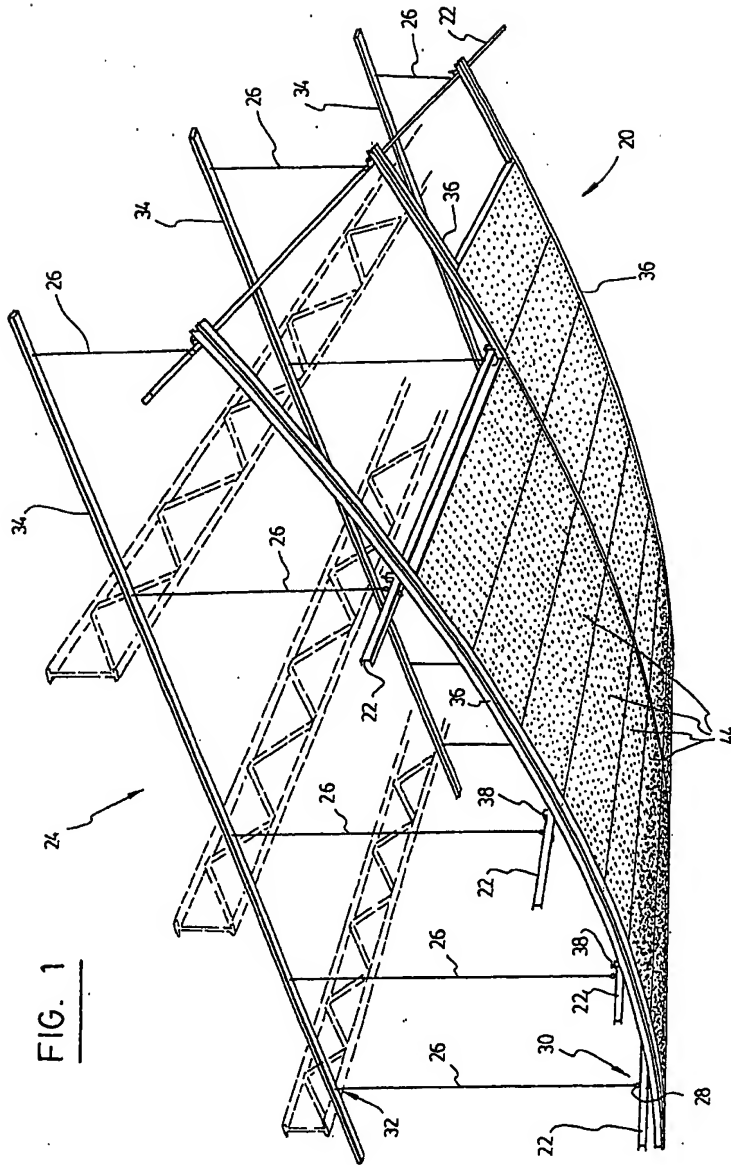
15. A method for mounting an inner ceiling under a framework of a roof, the method comprising steps of:

a) suspending a plurality of suspension beams underneath the framework in a parallel relationship to each other, a plurality of cables being provided for connecting the suspension beams to the framework, each of said cable having a length adapted to suspend a corresponding suspension beam at a predetermined distance from said framework;

b) mounting a plurality of mounting rails transversally underneath at least two of the suspension beams, each of said mounting rails having a top flange and a bottom mounting portion, a plurality of connecting members being provided for connecting the top flange of each one of the mounting rails to a corresponding suspension beam, each connecting member comprising a sleeve-shaped body for enclosing a cross-section of a corresponding suspension beam therein, fasteners for fastening said sleeve-shaped body to said corresponding suspension beam, and a hook-shaped bottom portion engageable with the top flange of a corresponding mounting rail for supporting said mounting rail; and

c) mounting a plurality of ceiling tiles between the mounting portions of adjacent mounting rails, thereby forming said inner ceiling.

16. A method according to claim 15, wherein each mounting rail mounted in step b) has an S-shaped cross-section forming a top hook defining the top flange and a bottom hook defining the mounting portion.



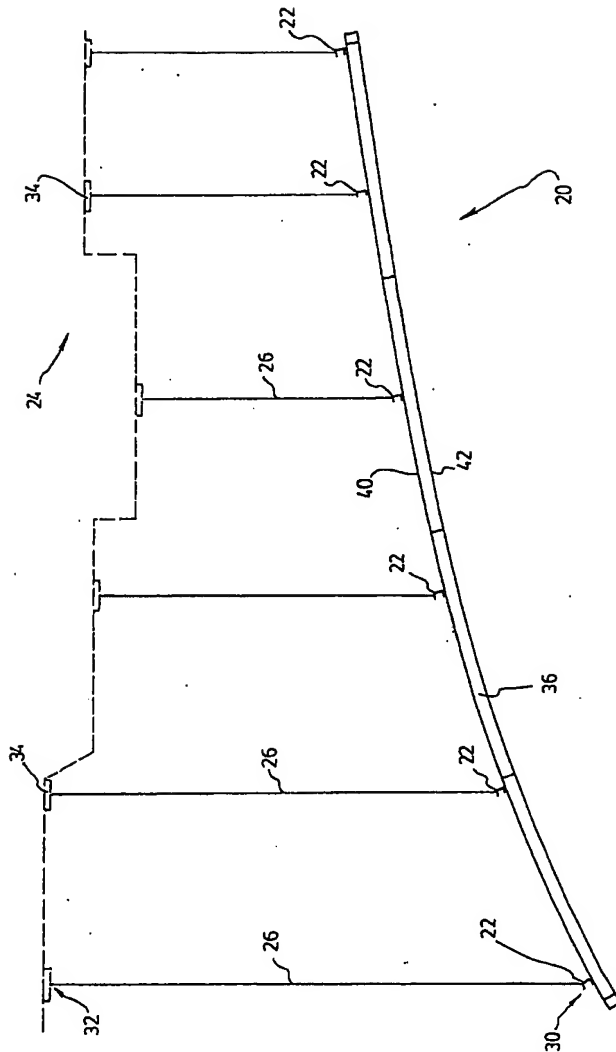


FIG. 2

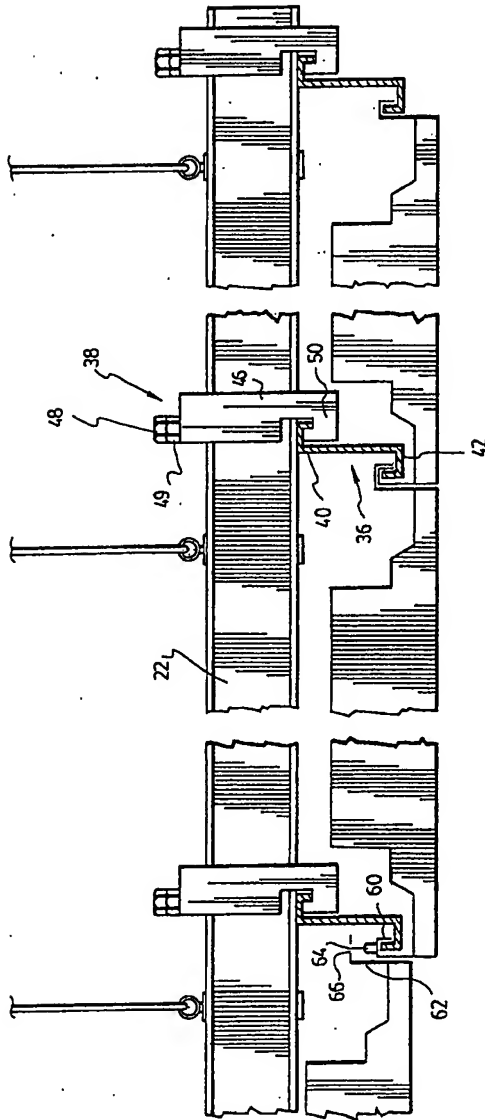


FIG. 3

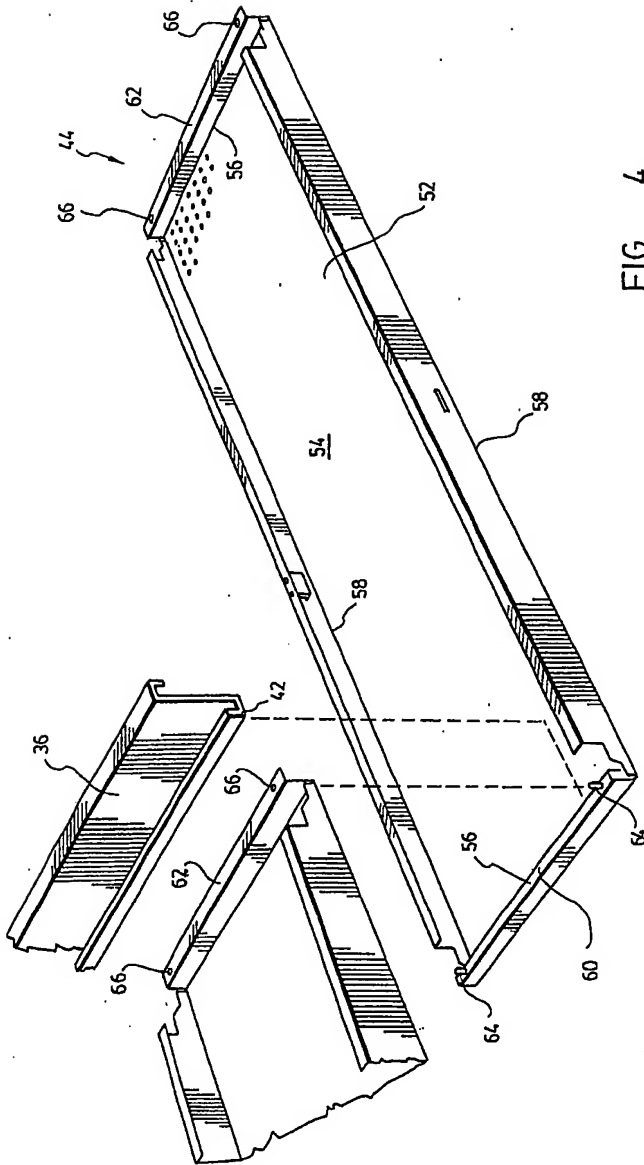


FIG. 4

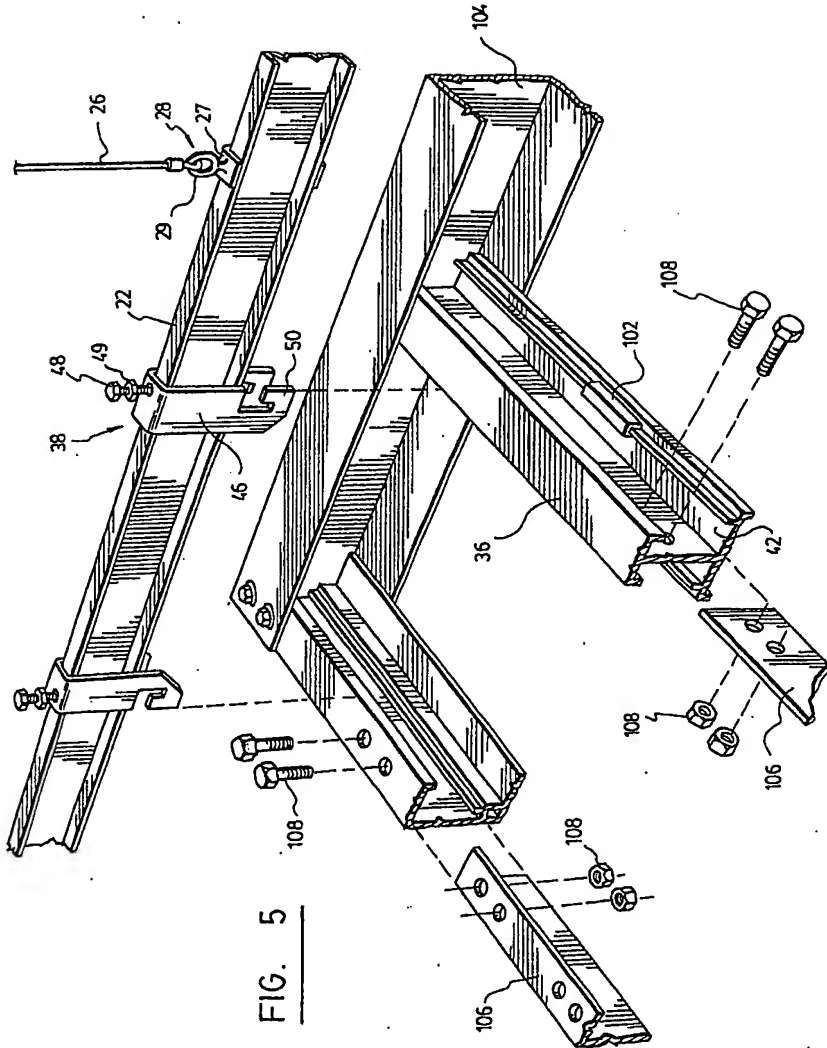


FIG. 5

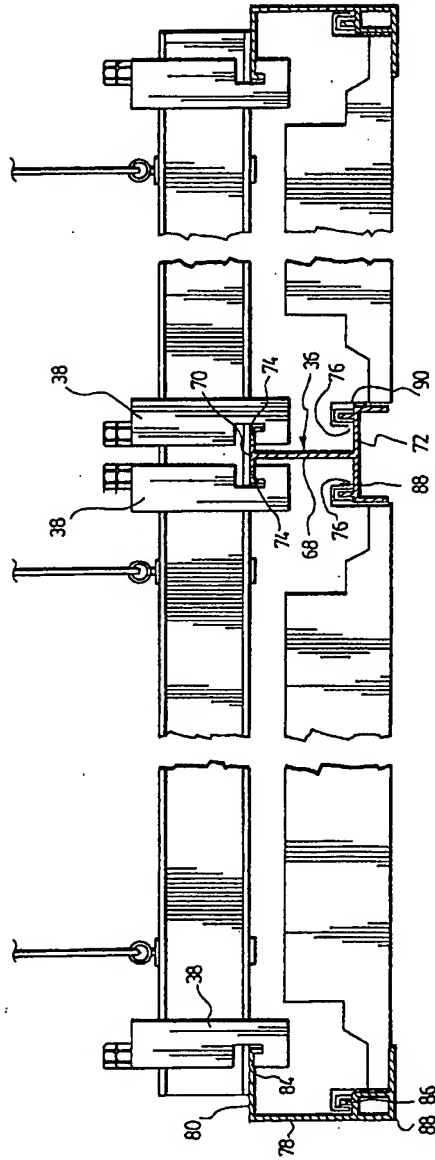
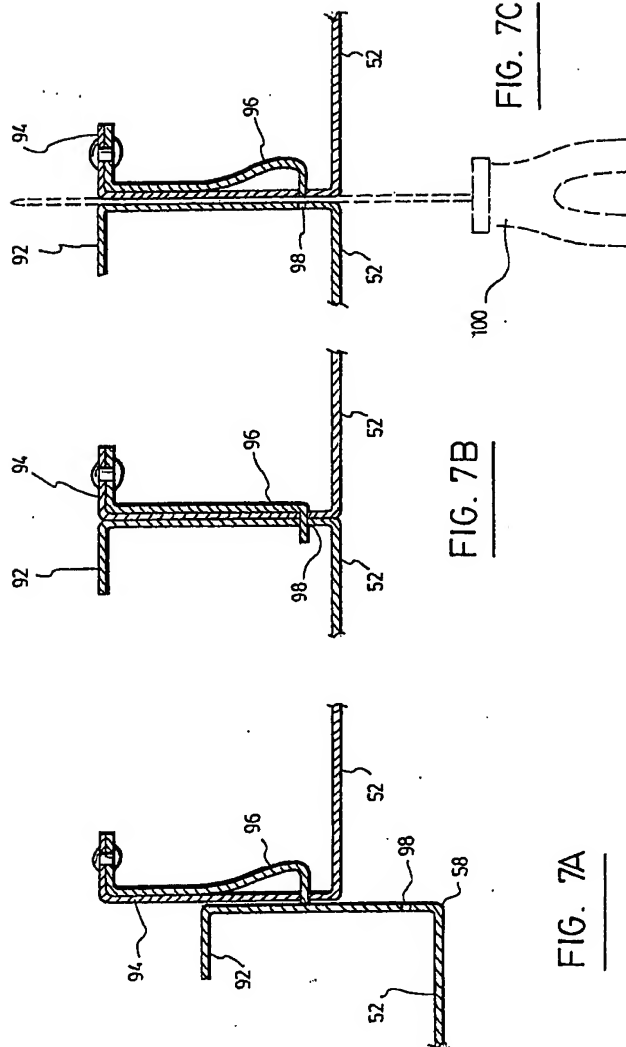


FIG. 6



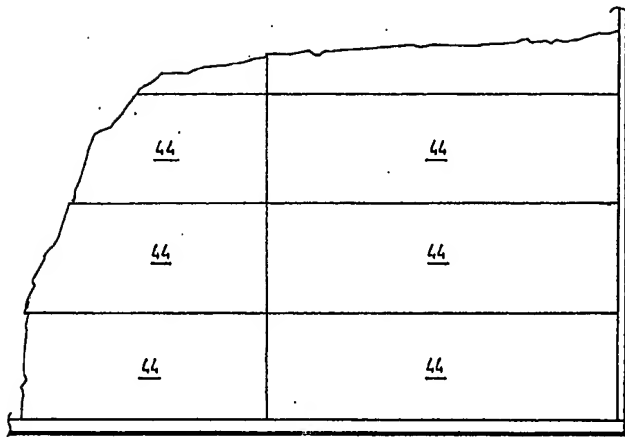


FIG. 8A

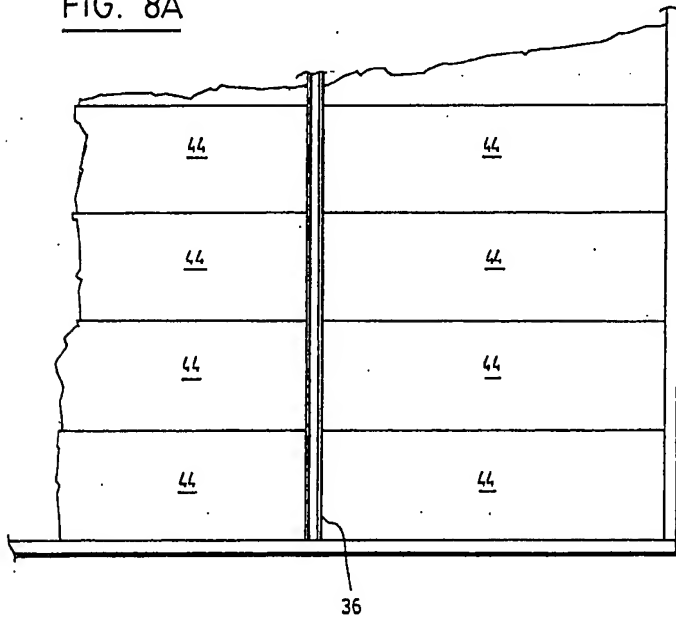


FIG. 8B